UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/042,475 | 01/09/2002 | Kenneth E. Dahlberg | PM 98.086 | 6077 |

7590 01/18/2006

Keith A. Bell
ExxonMobil Upstream Research Company
P.O. Box 2189
Houston, TX 77252-2189

| EXAMINER | |
|---|---|
| ALHIJA, SAIF A | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2128 | |

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/042,475 | DAHLBERG, KENNETH E. | |
| | Examiner | Art Unit | |
| | Saif A. Alhija | 2128 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 October 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/14/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

***Detailed Action***

**1.** Claims 1-12 have been presented for examination.

***Applicants Arguments***

**2.** Applicant's arguments with respect to claims 1-12 have been considered but are moot in view of the new ground(s) of rejection. See conclusion.

***Information Disclosure Statement***

**3.** The information disclosure statement (IDS) submitted on 14 October 2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the Examiner has considered the IDS as to the merits.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

**4.** **Claims 1-6, 8, and 10-12 are rejected** under 35 U.S.C. 102(a) as being clearly anticipated by **Malinverno et al. "Uncertainty Constrained Subsurface Modeling", WO 00/48022,** hereafter referred to as **Malinverno,**

**Regarding Claim 1:**

**Malinverno discloses** a method of analyzing data obtained from well logs taken in a subsurface geological to determine an expected value of the hydrocarbon pore volume of the formation, comprising:

(a) defining an initial model of the subsurface formation based upon estimates of different bed types and bed-type parameters in the formation, one of said bed-type parameters being aspect ratio, the initial model including a system of log equations for predicting well logs from bed-type parameters; **(Page 1, Paragraph 3, Background of Invention. Page 2, Paragraph 1. Page 8, Paragraph 2)**

(b) performing a Monte Carlo inversion to find the ranges of bed-type parameters consistent with the measured well log data; **(Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line)**

(c) determining a statistical distribution for hydrocarbon pore volume representing the expected value for and an uncertainty in the hydrocarbon pore volume from said Monte Carlo inversion. **(Page 4, Paragraph 1, Lines 1-3. Page 4, Paragraph 2, Lines 1-6)**

**Regarding Claim 2:**

**Malinverno discloses** the method of claim 1 wherein at least one of said bed types has a finite lateral extent and a positive aspect ratio. **(Page 8, Paragraph 2)**

**Regarding Claim 3:**

**Malinverno discloses** The method of claim 1 wherein the step of defining the initial subsurface formation model comprises:

(a) selecting an analysis interval; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line)**

(b) obtaining average values of the measured well log data over the analysis interval; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(c) formulating a set of reservoir and non-reservoir bed types constituting the selected analysis interval. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(d) determining average values of the petrophysical parameters for each bed type. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(e) assigning relative frequency of occurrence of the different bed types in the formation. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(f) computing log responses for each bed type and over the composite analysis interval; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(g) comparing the computed log responses to the measured log data for consistency. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(h) repeating steps (b) to (g) until the model parameters are consistent with the measured log data. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

**Regarding Claim 4:**

**Malinverno discloses** the method of claim 1 wherein the step of performing the Monte Carlo inversion comprises:

(a) estimating uncertainty ranges for each bed-type parameter and for bed frequencies. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(b) generating a random model consisting of random variants for each bed-type parameter and frequency; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(c) computing estimates of average log responses over an analysis interval of the model; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(d) comparing the computed log responses to the measured log data for consistency. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(e) retaining the model only if estimated log responses are consistent with measured log responses; **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(f) repeating steps (a) to (e) until a specified number of trials has been completed. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

(g) computing distribution statistics for interval hydrocarbon pore volume and related parameters. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

**Regarding Claim 5:**

**Malinverno discloses** the method of claim 1 wherein the step of performing the Monte Carlo inversion includes estimating uncertainties for the formation bed properties and for the volume fractions. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Page 8, Paragraph 2)**

**Regarding Claim 6:**

**Malinverno discloses** the method claim 1 wherein the step of performing a Monte Carlo inversion is carried out using a programmed digital computer. **(Figure 2)**

**Regarding Claim 8:**

**Malinverno discloses** the method of claim 7 wherein the accuracy of the input parameters of the formation model are described in terms of probability distributions of parameter values and wherein the

step of performing a Monte Carlo inversion involves making a plurality of cases wherein each case comprises a random selection of a parameter value for each input parameter from the probability distribution and calculating a set of outputs. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line)**

**Regarding Claim 10:**

**Malinverno discloses** the method of claim 9 wherein the step of performing a Monte Carlo inversion involves making at least one thousand cases and each resultant set of outputs comprises calculated log responses. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. This step would be inherent with respect to the prior art because an uncertainty is determined by measurements which in turn determine the number of models (cases) and thus includes any number of possible cases)**

**Regarding Claim 11:**

**Malinverno discloses** 11. The method of claim 10 wherein the resultant set of outputs from each case is retained only if that case produces a set of calculated log response outputs which correspond to the input log values within a specified closeness of fit. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line. Calculating a response with a specified closeness of fit is inherent with the Monte Carlo Method)**

**Regarding Claim 12:**

**Malinverno discloses** the method of claim 11 further comprising the step of storing the retained sets of outputs and analyzing them for a determination of uncertainty in the estimate of hydrocarbon pore volume. **(Figures 1 & 2. Page 4, Paragraph 1, Last 2 Lines. Page 4, Paragraph 2, Last Line)**

## *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**5. Claim(s) 7 and 9 are** rejected under 35 U.S.C. 103(a) as being unpatentable over **Malinverno** in view of **Tabanou et al. "Method and Apparatus for Detecting and Quantifying Hydrocarbon Bearing Laminated Reservoirs on a Workstation", U.S. Patent No. 5,461,562,** hereafter referred to as **Tabanou.**

**Regarding Claim 7:**

**Malinverno discloses** The method of claim 1 wherein the formation model has inputs which comprise a set of parameters describing the thinly bedded formation and has outputs which are the formation average porosity, average water saturation, and average hydrocarbon pore volume.

**Malinverno does not explicitly disclose** the sand fraction.

However, **Tabanou,** refers to the output of sand fraction. (**Tabanou,** Column 1, Lines 26-27. Column 2, Lines 37-38).

It would therefore have been obvious to a person of ordinary skill in the art to derive the formation properties discussed in **Malinverno** as well as including the formation properties discussed in **Tabanou** in order to acknowledge the amount of sand that is inherently present in the formation.

**Regarding Claim 9:**

**Malinverno does not explicitly disclose** the method of claim 8 wherein the step of performing a Monte Carlo inversion is made using a spreadsheet programmed in a digital computer and wherein each case involves a recalculation of the spreadsheet to obtain a resultant set of outputs.

However, **Tabanou,** refers to the use of ELAN software, which utilizes spreadsheets with respect to volumetric analysis. (**Tabanou,** Column 4, Lines 48-50).

It would therefore have been obvious to a person of ordinary skill in the art to perform the Monte Carlo inversion as discussed in **Malinverno**, utilizing spreadsheet software discussed in **Tabanou** in order to allow for better organization of statistical data as well as ease of recalculation and display.

## ***Conclusion***

**6.** Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on **14 October 2005** prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH

shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. The prior art made of record is not relied upon because it is cumulative to the applied rejection. These references include:

A) "The Analysis of Some Unsolved Induction Interpretation Problems using Computer Modeling" Barbara Anderson. SPWLA 27th Annual Logging Symposium, June 9-13 1986.

B) "Applications of NMR Measurements for Petrophysical Evaluation of Low-Resistivity Pay Zones". Gary M. Ostroff and David S. Shorey. 2000 Canadian Society of Exploratory Geophysicists Conference . May 31st 2000.

C) "Predictive Modeling of Naturally Fractured Reservoirs using Geomechanics and Flow Simulation" Stephen Bourne et al. Society of Petroleum Engineers 87253. October 2000.

SAA

December 22, 2005

HUGH JONES PH.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2150